Illness behavior in patients with musculoskeletal disease
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Citation for published version (APA):
Bot, A. G. J. (2013). Illness behavior in patients with musculoskeletal disease

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CHAPTER 14

Predictors of return after cast removal in patients with a nonoperatively treated distal radius fracture

Wendy E. Bruinsma, Arjan G.J. Bot and David C. Ring

Abstract
Patients with a nonoperatively treated fracture of the distal radius are often scheduled for a follow-up appointment after cast removal to assess function and outcome. Our experience is that, once the cast is off, many patients do not return. The purpose of this study was to determine which variables significantly influence return for a scheduled visit after cast removal. Thirty-seven patients enrolled in a prospective cohort study (27 men and 10 women) with an average age of 49 years (range, 19 to 82) had a distal radius fracture immobilized in a cast. During the visit at which the cast was removed, arm-specific disability, misinterpretation of nociception, and symptoms of depression were measured using validated questionnaires. Eleven of 37 patients did not attend the final scheduled office visit and the only predictor of a return visit was older age.
Introduction
Minimally displaced and nondisplaced fractures of the distal radius are treated with either a splint or cast, depending on the preference of the surgeon, type of fracture and patient characteristics. Initially displaced fractures that have been adequately reduced can also be treated with a cast. Most providers have the patient return at least once after cast removal in order to evaluate wrist mobility among other factors. We had the impression that many patients do not return once the cast is removed. This is important in clinical research where loss of patients can affect the experiment. It is also relevant to patient care although the influence of return visits after cast removal on final impairment and disability is incompletely understood.

This study addresses the null hypothesis that there are no differences between patients that do and do not return to the office for a scheduled visit after cast removal.

Methods
We used a convenience sample of 37 patients treated in a cast and asked to return for another scheduled appointment after cast removal from among a total of 57 patients with a nondisplaced or minimally displaced fracture of the distal radius that were enrolled in three prospective protocols addressing different study questions. Both the original protocols and this secondary use of the data were approved by the Institutional Review Board at our institution. The other 20 patients in those studies were treated in a removable splint. The patients were enrolled between January 2008 and November 2010. Patients were asked to fill out three specific questionnaires at 4 to 6 week follow-up; the Disabilities of the Arm, Shoulder, and Hand (DASH), The Pain Catastrophizing Scale (PCS) and The Center for Epidemiological Studies – Depression scale (CES-D).

The (DASH) is a self-administered assessment tool of symptoms and functional status in patients with musculoskeletal disorders of the upper extremity. The 30 questions are scored on five-point scales. A higher score represents a worse upper extremity function.

The PCS is used to determine the extent to which patients cope with pain through cognitive activities that intensify aspects of their pain experience, and measures three aspects of pain catastrophizing: rumination (the tendency to relive painful experiences), magnification (the propensity to amplify pain), and helplessness. Questions are answered on a scale from 1 to 4, where high scores represent greater catastrophizing of the pain and inability to cope effectively.

The CES-D is used to assess depressive symptoms and measures depressed mood, feelings of guilt and worthlessness, of helplessness and hopelessness, loss of appetite and sleep disturbance. The responses are administered to four-point scales that reflect how many times a patient experienced these symptoms during the past week. Scores range from 0 to 60 with a higher score representing greater depressive symptoms.

Patient characteristics
There were 27 men and 10 women with an average age of 49 years (range, 19 to 82 years). Average number of educational years was 15 (range 12 to 20 years). Most patients were either single (14) or married (14). Six patients were divorced or separated and three patients were widowed (Table 1).
Table 1 Patient demographics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
<th>Number</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>49</td>
<td>(19-82)</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>women</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>men</td>
<td></td>
<td></td>
<td>27</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>single</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>married</td>
<td></td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>separated/divorced</td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>widowed</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Years of education</td>
<td>15</td>
<td>(12-20)</td>
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<td>24</td>
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<tr>
<td>right</td>
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<td></td>
<td>13</td>
</tr>
</tbody>
</table>

Statistical Analysis

Kolmogorov-Smirnov and Shapiro-Wilk test indicated that CES-D was not normally distributed. Because not all questionnaires were normally distributed, we decided to use nonparametric tests for further analysis.

In bivariate analysis, the association between the DASH score with continuous independent variables was investigated using Spearman-rho correlation. These were: age, education in years, PCS, and CES-D. For the association of the DASH with dichotomous independent variables (sex and follow-up visit) a Mann-Whitney U test was conducted. A Kruskal-Wallis test was used to assess for the association of marital status with the DASH-questionnaire.

For the bivariate analysis of follow-up visit with continuous variables (age, education in years, CES-D, PCS, and DASH) a point biserial correlation analysis was executed. With a chi-square test (2-tailed) the association between follow-up visit and sex and marital status was analyzed.

Variables that were significant ($p<0.05$) or near significant ($p<0.10$) were entered into a backwards, stepwise multivariable linear regression model looking for independent predictors of DASH and follow-up visit.

Post-hoc regression power analysis revealed that 37 patients provided 84% power for a multiple regression (with an $\alpha=0.05$) with an R-squared of 0.2.
Table 2 Differences between patients with follow-up and patients who did not attend follow-up

<table>
<thead>
<tr>
<th>Follow-up (n=26)</th>
<th>No follow-up (n=11)</th>
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</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>Mean (SD) 54 (17) (23-82)</td>
</tr>
<tr>
<td>Sex</td>
<td>women 5</td>
</tr>
<tr>
<td></td>
<td>men 21</td>
</tr>
<tr>
<td>Marital Status</td>
<td>single 9</td>
</tr>
<tr>
<td></td>
<td>married 10</td>
</tr>
<tr>
<td></td>
<td>separated/divorced 5</td>
</tr>
<tr>
<td></td>
<td>widowed 2</td>
</tr>
<tr>
<td>Years of education</td>
<td>16 (2.4) (12-19)</td>
</tr>
<tr>
<td>°DASH</td>
<td>38 (18) (13-82)</td>
</tr>
<tr>
<td>^CES-D</td>
<td>13 (10) (0-37)</td>
</tr>
<tr>
<td>•PCS</td>
<td>5.4 (6.3) (0-23)</td>
</tr>
</tbody>
</table>

\*DASH: Disabilities of the Arm, Shoulder and Hand
^CES-D: Center for Epidemiological Studies Depression Scale
•PCS = Pain Catastrophizing Scale

**Results**

The mean DASH-score in the entire cohort was 36 (SD 19) (range, 2.5 to 82), the mean CES-D score was 13 (SD 10) (range, 0 to 37) and the mean PCS was 5.2 (SD 6.8) (range, 0 to 26) (table 2). Eleven of the 37 patients did not attend the scheduled follow-up visit.

**Bivariate and Multivariable Analysis of the Questionnaires**

The only variable associated with attendance at the scheduled follow-up visit was older age (r=0.44, p=0.006). Depression, sex, DASH, education in years, and marital status were not associated with attendance at the scheduled follow-up visit. PCS and age were the only factors associated with a higher DASH. The final model in multivariable analysis contained PCS and explained 8.9% of the variability of DASH (p=0.041) (Table 3).
Discussion

Our research group has been addressing loss to follow-up in patients treated for a fracture. To the best of our knowledge, not much has been written about return after cast removal in patients with a nonoperatively treated distal radius fracture. It occurred to us that patients with casts have to return to have the cast removed, but might not attend subsequent scheduled follow-ups. We analyzed follow-up behavior after cast removal and found that 11 of 37 patients did not return to scheduled follow-up, with older age as the only significant variable contributing to return.

There are, however, a few limitations to this study. Even though post hoc power analysis showed that the study was adequately powered, our sample size is small. Also, our sample was drawn from three other observational cohort studies. Because the patients in these cohorts were actively enrolled, they might have had a greater sense of responsibility and were more obliged to return to scheduled follow-up. The percentage of patients that would not return to scheduled follow-up would therefore be higher in the general patient population compared to our study.

Tejwani et al. reported that 54 of 293 patients with an operatively or nonoperatively treated distal radius fracture did not keep scheduled appointments beyond 2 weeks after injury. There were no differences in age, sex, mechanism of injury, marital status, hand dominance, or Workers’ Compensation claims between patients that attended and those that did not attend these appointments. Nonoperative management, lack of postsecondary education, and SF-36 predicted loss to follow-up. In contrast our non-attenders did not have significant worse health or lower education.

Other studies have found age, level of income, type of treatment and level of education to possibly play a role in patients lost to follow-up after calcaneal fractures, total hip replacements and rotator cuff tears. Midgley and Toemen prospectively evaluated 50 patients with a metacarpal fracture that had provided written consent to telephone contact at a minimum of 10 weeks post injury. Thirty-eight percent of patients were lost to follow-up, which the authors contributed to a predominantly working age of their study population (17-36 years), making contact during working hours difficult. Other prospective studies on metacarpal fractures report loss to follow up of 4%-25%. Our results are comparable to the findings of Solberg et al., who studied loss to follow-up after spinal surgery. They found that older patients were more likely to return.

Some studies suggest that patients that miss scheduled appointments may be doing worse, but that probably depends on the context. For instance, Murray et al. found that patients that miss scheduled appointments to monitor total hip arthroplasty had significantly worse pain, less range of motion, worse opinion of their progress and worse radiological features compared to those that kept scheduled appointments. In contrast; Bansal and Craigian divided patients with an uncomplicated metacarpal fracture that could be treated nonoperatively into two groups: one group was treated with a plaster and was seen at 3 and 6 weeks, the other group was treated with buddy taping and was not scheduled any follow-up appointments. Both groups were contacted by phone after 12 weeks to determine treatment satisfaction and disability. In the group treated with the plaster, 29% of appointments were not attended and four patients did not return at all. In the second group, treated with the strapping, two patients came back for a follow-up appointment. In the first group, there was no difference in satisfaction in patients that attended or missed appointments. When asked by phone after 12 weeks, none of the patients in the second group had deemed a follow-up appointment necessary, even the two patients that made their own follow-up appointment in the clinic. There was no significant difference in disability between group I and II.

Wildner analyzed a retrospective study in which patients that had rotator cuff surgery were invited for a late review for a subjective grading of their outcome. Of the 49 patients, 43%
accepted the invitation and of the remaining 37% of the patients were traced and contacted by phone. Wildner offered five reasons why patients may not attend follow-up visits scheduled for study purposes: 1. Patients are dissatisfied; 2. Patients are satisfied and do not want to be bothered; 3. Death; 4. Change of address; 5. Patients are dissatisfied with follow-up studies and paperwork.

In our opinion, inconvenience might be the most likely reason for non-attendance at scheduled follow-up in our patient population because patients were likely satisfied with their recovery and self-sufficient after cast removal. The loss of patients involved in prospective clinical research is undesirable, and clearly we need patients to understand and place value on how society benefits from the data gathered at their return visit. In day-to-day care of patients, it’s worth considering that routine follow-up may not be necessary for fractures with a low risk of adverse events. These issues merit additional study.
References